March 3, 1936. I. C. JENNINGS 2,033,032

PUMP CONTROLLING MECHANISM

Filed Oct. 13, 1933 2 Sheets-Sheet 1

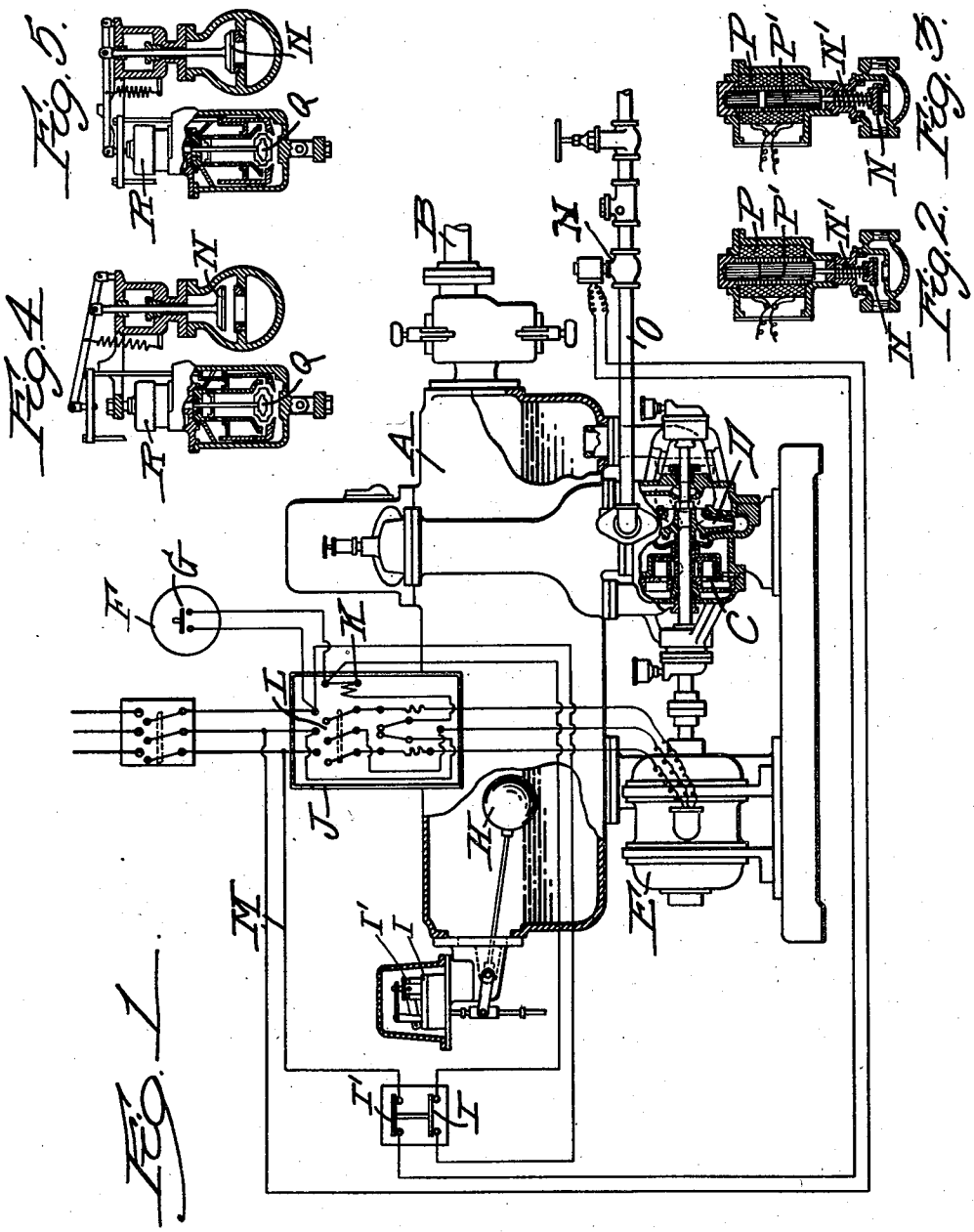


Fig. 1.

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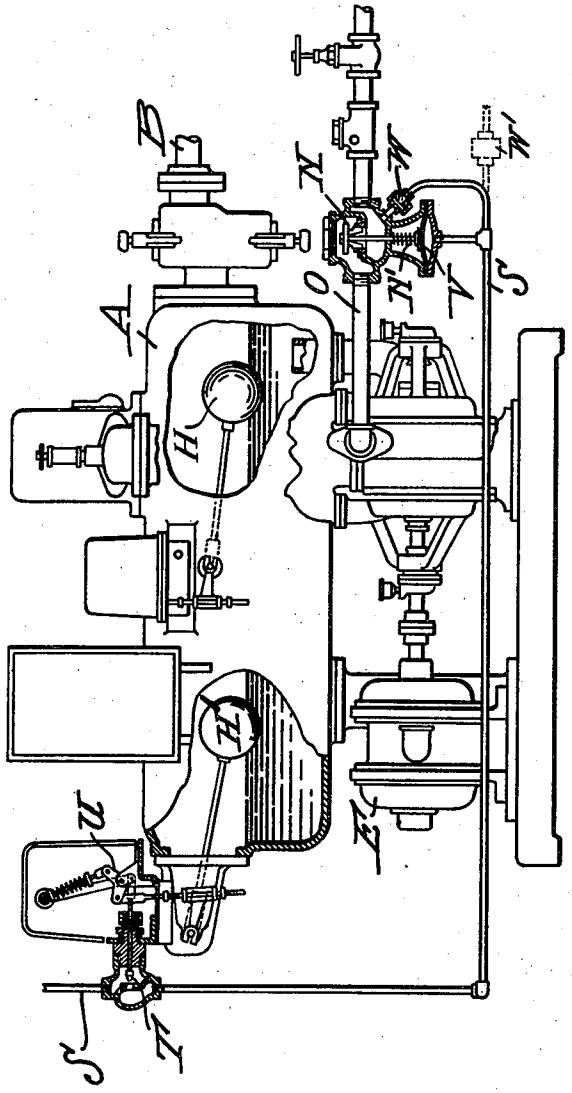


Fig. 2.

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Patented Mar. 3, 1936 2,033,032

UNITED STATES PATENT OFFICE

2,033,032

PUMP CONTROLLING MECHANISM

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Application October 13, 1933, Serial No. 693,509

12 Claims. (Cl. 103—26)

The object of this invention is to provide a new and improved mechanism for controlling the operation of a pump, particularly a centrifugal pump.

The invention has special application to the pumping mechanism used in a vacuum steam heating system, in which the returns are received in a separating tank, the water in the bottom of the tank pumped back to the boiler by the centrifugal pump and the air or gases in the top of the tank removed by an air pump. Such mechanism is shown and described in Letters Patent reissued to me June 26, 1923, No. 15,637.

In such an arrangement, the capacity of the centrifugal pump has to be larger than the amount of water coming into the separating tank in order always to be able to empty the tank. If there is no means to prevent it, the centrifugal pump at times will have its intake uncovered and become air-bound. This action disables the centrifugal pump for water and when water once more covers the intake to the centrifugal, a portion of the air in the centrifugal rotor will be delivered through the eduction of the pump. Some of this air will be dissolved by the water, and the remaining air and dissolved oxygen will be forced through the pump and this mixture will tend to cause a corrosive action in the piping, boiler or tanks receiving this water.

This action takes place particularly in the mechanism of my prior patent, as the centrifugal rotor and the air pump are mounted on a common shaft driven by an electric motor controlled by a circuit having two breaks in multiple, one break being controlled by a vacuum controller and the other by a float arranged in the tank.

With this apparatus, if the water should be all pumped out of the receiving tank and the desired vacuum not obtained, the motor will continue to operate so that the centrifugal rotor will cause the deleterious action previously described.

I remedy the defect previously described by placing a shut-off valve in the pump line, preferably in the eduction extending from the pump and by providing connections from the float arranged so that the valve will be kept wide open when the pump is to operate to withdraw water from the tank and will be kept closed when the pump is not to operate.

This controlling means is operated by extraneous power such as electric, pneumatic or hydraulic.

A convenient way to couple up this shut-off valve in the pump line is to provide a circuit extending from the circuit controlled by the float and to connect said circuit to electric means such as a solenoid or a motor for opening and closing said valve.

By this arrangement, the valve will be either wide open when the pump is to operate or closed when the pump is not to operate. As no throttling action is obtained, the pump will operate economically at full capacity and there will be no wire drawing through the valve which will tend to cut the seat. Also as the valve has to be of considerable size, by using extraneous power to operate the same, dependence will not be placed upon the rising or falling of the float for power to open and close the valve. The power obtained by the rising and falling of a float is relatively small and if used for extra work, the float will be apt to become inoperative or stick.

The invention is illustrated in the accompanying two sheets of drawings, in which

Fig. 1 is a sectional elevation, partly in section and partly in diagram, illustrating the invention where electricity is used as the extraneous power;

Figs. 2 and 3 are detail sectional views illustrating one form of electrical operating mechanism which may be used;

Figs. 4 and 5 are similar views illustrating another form of electrically operating mechanism which may be used, and

Fig. 6 is a view similar to Fig. 1 illustrating the operation when the extraneous power is either hydraulic or pneumatic.

Referring to the drawings and in detail, A designates the receiver or separating tank into which the returns are led through a return pipe B.

The pumping mechanism comprises an air pump C and a centrifugal pump D arranged on a common shaft and driven by an electric motor E.

A vacuum regulator F is connected to the tank and controls an electric switch G. A water operated means such as a float H is arranged in the tank and controls a double switch I—I' shown in diagram at the left of Fig. 1. The circuit extending from the switch I operates a self-starter J, comprising a closing coil K, which actuates a three-pole switch L, which closes and opens the circuits extending to the electric motor E.

With the exception of the switch I', these parts are arranged substantially as shown in my said prior patent, and act to control the motor so that the same operates either when the desired vacuum is not obtained in the tank or when the water is to be pumped from the tank, or when both conditions exist.

It will be seen that when the water has been removed from the tank down to the low desired water level, the pumps may continue in operation if the vacuum is not reduced to the desired point, thus leading to the deleterious results previously described.

A circuit M is led from two of the feed wires, through the switch I' previously referred to and is connected to operate the electrical mechanism hereinafter described.

A valve N is arranged in the eduction pipe O of the pump, which valve is kept normally closed by spring N'.

In the structure shown in Figs. 2 and 3, this valve is open and closed by a solenoid P, the armature P' of which is connected to the valve N, the valve being shown in wide open position in Fig. 2 and in closed position in Fig. 3.

By this arrangement, when the switch I—I' is closed and water is to be withdrawn from the tank by the centrifugal pump D, the valve will be opened and the pump will be operated economically at full capacity.

When the water has been drawn down to the desired low level, the float opens the switch I—I' and opens the circuit extending to the pump and also opens the circuit M extending to the solenoid so that the same will be deenergized and so that the spring N' will close the valve N.

Thus the pump will operate as previously described at full capacity when water is to be pumped, as the valve thus will be open and so that when the pump is not to operate to draw water from the tank, the valve N will be closed.

The valve only has two positions, wide open or closed. The float is set to open the double switch I—I' before the inlet or induction to the centrifugal pump has been entirely uncovered so that if the pump continues to run, the same will not become air-bound, and whereby if there is any leakage between the pumps, it will be of water from the centrifugal pump over to the vacuum pump.

Thus there will be a solid volume of water behind and in front of the centrifugal rotor, when it is not to pump and thus no air or gas can pass through the eduction of the centrifugal pump, thus giving the desirable results previously referred to.

In Figs. 4 and 5 an alternative mechanism for opening and closing the valve is illustrated, the valve being shown open in Fig. 4 and closed in Fig. 5.

This mechanism comprises a pump Q operated by a small motor R, and employing oil, which pump is connected to a piston connected to the valve, the parts being arranged so that when the circuit extending from the switch I' is closed to operate the motor, the same will open the valve and so that when the said circuit is opened, the valve N will close. This electric operated mechanism is shown more in detail in Patent No. 1,867,393, granted July 12, 1932 in the name of William J. Woods.

Referring now to the modification shown in Fig. 6, a pipe S extending from a source of fluid pressure has a valve T arranged therein, which valve is opened and closed through a snap action connection U by float H'. The shut-off valve N is closed by the spring N' and is connected to a piston or diagragm V, the pipe S being connected under this piston or diaphragm. The pipe S is also connected into the casing of the valve N through a small bleed W.

When the water rises in the tank A to the desired high level, the float H' will open the valve T through the snap action U and the pressure acting under piston V will open valve N and the centrifugal pump will act to pump water from the tank A, the parts being shown in this position in Fig. 6.

When the water drops to the desired or adjusted low level, the float H' will close the valve T through the snap action U and the pressure in the pipe S will be relieved through bleed W, and the spring N' will close the valve N and thus the pump will be cut out of operation.

The float control at the right of Fig. 6, corresponds to the float H of Fig. 1.

If the pipe S is connected to a source of air pressure, the bleed W' shown in dotted lines is employed, instead of the bleed W. This apparatus operates in principle the same as that previously described and obtains the advantages before specified.

The details and arrangements herein shown and described may be greatly varied by a skilled mechanic without departing from the scope of my invention as expressed in the claims.

Having thus fully described my invention, what I claim and desire to secure by Letters Patent is:—

1. A pumping mechanism for a vacuum steam heating system comprising a pump for creating a vacuum in the system, a tank to which the returns from the system can be led, a pump connected to draw water therefrom, a motor for driving the pump, a float in the tank, a shut-off valve for controlling the flow through the pump line, and connections from the float arranged so that the valve will be kept wide open when the pump is to operate to draw water from the tank and will be kept closed when the pump is not to operate.

2. A pumping mechanism for a vacuum steam heating system comprising a pump for creating a vacuum in the system, a tank to which the returns from the system can be led, a pump connected to draw water therefrom, a motor for driving the pump, a float in the tank connected to control the operation of the motor, a shut-off valve for controlling the flow through the pump, and connections from the float arranged so that the valve will be kept wide open when the pump is to operate to withdraw water from the tank and will be closed when the pump is not to operate.

3. A pumping mechanism for a vacuum steam heating system comprising a pump for creating a vacuum in the system, a tank to which the returns from the system can be led, a pump connected to draw water therefrom, a motor for driving the pump, a float in the tank connected to control the operation of the motor, a shut-off valve for controlling the flow through the pump line, mechanism operated by extraneous power for opening and closing said valve, and connections from said float to control the operation of said mechanism arranged so that the valve will be kept wide open when the pump is to operate to withdraw water from the tank and will be kept closed when the pump is not to operate.

4. A pumping mechanism for a vacuum steam heating system comprising a pump for creating a vacuum in the system, a tank to which the returns from the system can be led, a pump connected to draw water therefrom, an electric motor for driving the pump, a float in the tank, a double switch controlled by the float, a circuit extending from the said switch to the motor, a shut-off valve for controlling the flow through the pump

line, electric mechanism for opening and closing said valve, and another circuit extending from said switch to said electric mechanism.

5. A pumping mechanism for a vacuum steam heating system comprising a pump for creating a vacuum in the system, a tank to which the returns from the system can be led, a pump for withdrawing water therefrom, a valve in the pump line, fluid pressure actuated mechanism for opening and closing said valve, a float in the tank, and connections therefrom to control the operation of the pressure-operating mechanism.

6. A pumping mechanism for a vacuum steam heating system comprising a pump for creating a vacuum in the system, a tank to which the returns from the system can be led, a pump, a connection from the tank to the pump extending into the tank above the bottom thereof, a float in the tank connected to control the operation of the pump, a shut-off valve for controlling the flow through the pump, and connections from the float to open and close said valve, the low water level obtained by the float being above the induction to the pump, whereby the pump will be kept full of water when the valve is closed.

7. A pumping mechanism for a vacuum steam heating system comprising a pump for creating a vacuum in the system, a tank to which the returns from the system can be led, a pump, connected to draw water therefrom, a motor for driving the pump, water operated means in the tank, a shut-off valve for controlling the flow through the pump line and connections from said means arranged so that the valve will be kept wide open when the pump is to operate to draw the water from the tank and will be kept closed when the pump is not to operate.

8. A pumping mechanism for a vacuum steam heating system comprising a pump for creating a vacuum in the system, a tank to which the returns from the system can be led, a pump, connected to draw water therefrom, a motor for driving the pump, water operated means in the tank connected to control the operation of the motor, a shut-off valve for controlling the flow through the pump line, mechanism operated by extraneous power for opening and closing said valve, and connections from said float to control the operation of said mechanism arranged so that the valve will be kept wide open when the pump is to operate to withdraw water from the tank and will be kept closed when the pump is not to operate.

9. A pumping mechanism for a vacuum steam heating system comprising a tank, a vacuum pump and a water pump connected to said tank, an electric motor for driving said pumps, a float in the tank, a shut-off valve for controlling the flow through the water pump line and connections from the float arranged so that the valve will be kept wide open when the water pump is to operate to draw water from the tank and will be kept closed when the water pump is not to operate.

10. A pumping mechanism for a vacuum steam heating system comprising a tank to which the returns from the system can be led, a pump, for creating a vacuum in the system, a pump connected to draw water from the tank, a motor for driving the water pump, a float in the tank, a shut-off valve for controlling the flow through the water pump line, electric connections from the float arranged so that the valve will be kept wide open when the pump is to operate to draw water from the tank, and will be kept closed when the water pump is not to operate, and switches operated by the vacuum controller and by the float arranged in multiple so that the motor will operate when either or both of said switches is or are closed.

11. A pumping mechanism for a vacuum steam heating system comprising a tank to which the returns from the system can be led, a rotary vacuum pump for creating a vacuum in the system, and a centrifugal water pump arranged to draw water from the tank, an electric motor for driving said pumps, a float in the tank, a shut-off valve for controlling flow through the water pump line, an electric connection from the float arranged so that the valve will be kept wide open when the water pump is to operate to draw water from the tank and will be kept closed when the water pump is not to operate, a vacuum controller operating a switch, and a switch operated by the float, said switches being arranged in multiple so that the motor will operate when either or both of said switches is or are closed.

12. A pumping mechanism for a vacuum steam heating system comprising a tank to which the returns from the system can be led, a pump, for creating a vacuum in the system, a water pump arranged below the tank connected to draw water therefrom, a motor for driving this pump, a float in the tank, a shut-off valve for controlling the flow through the water pump line, and connections from the float arranged so that the valve will be kept wide open when the water pump is to operate to draw water from the tank, and will be kept closed when the pump is not to operate.

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